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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)
)
Revision of Part 97 of the Rules)
Governing the Amateur Radio) RM- _____
Services Concerning High-Frequency)
Data Communications)

To: The Commission

PETITION FOR RULE MAKING

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SUMMARY

The American Radio Relay League, Incorporated (the League), the national non-profit association of amateur radio operators in the United States, requests that the Commission issue a Notice of Proposed Rule Making looking toward changes in Part 97 of the Commission's Rules governing the Amateur Radio Services (47 C.F.R. Section 97.1 et seq.) to permit automatic control of RTTY and data communications in certain specified portions of the high-frequency (HF) amateur bands, under certain conditions.

The League invokes the information gained from experiments conducted pursuant to special temporary authorization; from the work of its committees of radio amateurs with expertise in this area; from a previous notice and comment proceeding; and from a more recently conducted survey, in submitting this petition. The benefits of some automatically controlled data communications include the encouragement of experimentation, development and refinement of these efficient communications modes; adaptation of complex digital technologies to practical use; and permitting the implementation in the Amateur Radio Services of more efficient emergency and public service communications technologies for rapid information transfer. Changes in internationally established band plans make the instant proposal feasible and likely of acceptance by a large majority of radio amateurs active in high-frequency amateur radio operation.

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PETITION FOR RULE MAKING

The American Radio Relay League, Incorporated (the League), the national non-profit association of amateur radio operators in the United States, by counsel and pursuant to Section 1.401 of the Commission's Rules, hereby respectfully requests that the Commission issue a Notice of Proposed Rule Making at an early date, looking toward changes in Part 97 of the Commission's Rules governing the Amateur Radio Services (47 C.F.R. Section 97.1 et seq.) in accordance with the attached Appendix, so as to permit automatic control of RTTY and data communications in certain specified portions of the high-frequency (HF) amateur bands, under certain conditions. The League's goal in submitting this petition is to encourage experimentation, development and refinement of these efficient communications modes; to adapt complex digital technologies to practical use; and to permit the implementation in the Amateur Radio Services of more efficient emergency and public service communications technologies for rapid information transfer. As good cause for its petition, the League states as follows:

I. Introduction

1. A recent Notice of Inquiry issued by the National Telecommunications and Information Administration (NTIA)¹ stated that currently, the Amateur Service performs an important and useful function as an adaptor of complicated and expensive technologies, often producing versions of communications systems more suitable for practical use.² This is an apt description of the abilities of the Amateur Radio Services in the area of new, especially digital, communications. Improvements in digital communications modes and protocols, and adaptations of data modes and protocols, are proceeding at a rapid pace. The Commission has been a partner with the Amateur Radio Service in this process, by creating or revising rules to permit the development or implementation of such technology, and by granting experimental licenses or issuing special temporary authorizations where necessary in specific cases. The results of these efforts have often flowed to licensees in other radio services, which have used amateur-developed equipment and communications protocols commercially.

2. Digital communications in the high-frequency (HF) amateur bands are enjoying a period of especially rapid development. While current rules allow considerable latitude in terms of what digital

¹ Docket No. 920532-2132; 57 Fed. Reg. 25010, June 12, 1992.

² Id., 57 Fed. reg. at 25018.

modes are permitted in amateur bands, certain modes are more firmly entrenched in operating patterns than others. Current data operation in the HF bands includes RTTY, a non-error protected simplex mode, usually using the Baudot code; AMTOR, a partially error-protected mode using the ASCII code; and packet radio (packet), an error-protected mode using the ASCII code. In addition, the Amateur community is presently experimenting with a new DSP-based system called CLOVER which is an error-protected, highly spectrum efficient mode, and with PACTOR, an error-protected mode.

3. Digital techniques for HF operation are improving, and newer technologies such as PACTOR and CLOVER promise significant near-term improvements under difficult ionospheric conditions in the HF bands. While the rules contemplate the use of these modes in the HF bands, they do not accommodate a full exploration of the capabilities and utilities, such as automatic networking, offered by them, due to the requirement of local or remote control for amateur stations operating below 50 MHz³. This is one of those infrequent instances where, in order to allow the Amateur Radio Service the technological flexibility it requires to develop and adapt new technologies to practical use, the rules require some fine tuning.

³ See, 47 C.F.R. §97.109(d). The only earth stations authorized to operate under automatic control below 50 Mhz under current rules are certain repeater stations and beacon stations. See, 47 C.F.R. §§97.205 (b) and (d), and 97.203(d).

II. Background: The STA

4. The Amateur Radio Service Rules currently permit automatic control of digital communications, but only above 50 MHz.⁴ Third party communications cannot be transmitted under automatic control except for packet stations above 50 MHz while using the AX.25 packet protocol.⁵ Automatic control of data communications was first authorized by the Report and Order⁶ in Docket 85-105, which, in turn, was based on a Petition for Rule Making seeking such authority, filed by the League.⁷ Therein, the League proposed, and the Commission implemented, automatic control provisions only at VHF and above, though numerous commenters in that rule making proceeding suggested that automatic control should be permitted at MF and HF frequencies between 1.8 and 29.5 MHz as well, either on a regular basis or, at least initially, by special temporary authority (STA). The rationale stated at the time was that coast-to-coast coverage for point-to-point message handling networks, which could be done at great speed (but for the local control requirement), would be accommodated by allowing data networks to operate under automatic control on MF and HF frequencies. The Commission was (properly) concerned, however, about the congestion

⁴ 47 C.F.R. Section 97.109(d).

⁵ See, 47 C.F.R. §97.109(e).

⁶ 59 RR 2d 1324 (1986).

⁷ RM-4879.

in the heavily used MF and HF bands, and concluded, as the result of that concern, that it would be inadvisable to permit automatically controlled stations on those frequencies without some limitation. The fear was that automatically controlled stations would create interference on frequencies potentially occupied by locally controlled users of other, incompatible modes, because the automatically controlled stations would transmit on occupied frequencies without regard to the status of frequency occupancy.

5. In the Commission's Report and Order in Docket 85-105, there was a strong reaffirmation of the limitations on automatic control of third-party communications. The League, among others, noted that those limitations effectively precluded the developing use of digital modes, and especially packet, using the AX.25 protocol. That was the digital mode which was growing most rapidly at the time, and which offered great promise for data networks at VHF and above. In response to a petition for extraordinary relief filed by the League following the Docket 85-105 Report and Order, the Chief, Private Radio Bureau, excepted intermediate stations in a network, using the AX.25 protocol, from the general prohibition of the conduct of third-party communications while a station is under automatic control. Thus, stations could operate under automatic control when retransmitting third-party traffic at VHF and above using the AX.25 packet protocol. The Commission

determined that the safeguards in such operation were sufficient to protect the Amateur Service against commercial encroachment.⁸

6. Several reconsideration petitions filed in Docket 85-105 requested rethinking of the prohibition of automatic control of digital communications below VHF. Those petitions suggested that automatic control at HF frequencies using digital modes was reasonable and necessary to facilitate rapid wide-area message handling, especially for disaster relief communications. The League suggested that permanent authorization for such would be premature while operating standards for packet and other data modes were still rapidly evolving. A better approach, said the League, was to coordinate a small group of data communications enthusiasts, and for the League to request special temporary authorizations (STAs) for the group, thus to determine the feasibility of permanent authorization of such operation by rule. The Commission agreed with this approach, and dismissed the reconsideration petitions, stating:

With respect to the matter of authorizing automatic control of amateur stations transmitting digital communications below VHF, we will defer further consideration of such expansion. Organized feasibility projects conducted by a manageable group of amateur stations such as that planned by ARRL will be helpful in determining any rules necessary to prevent interference to and from other amateur operations.⁹

⁸ See, the Memorandum Opinion and Order, FCC 86-427, released October 16, 1986, at paragraph 8.

⁹ Id., at paragraph 9.

7. In June of 1987, the League filed an STA request, seeking authorization for automatic control of certain specified HF packet stations constituting a message-handling network to be known as SKIPNET. The Commission granted the STA for an initial 180-day period, and has renewed it continuously since, to permit continued experimentation while urging development of permanent rules for automatic control of HF data communications. The current extension thereof is effective until February 3, 1993. The Chief, Private Radio Bureau noted in a recent letter extension of the STA that the Commission did not contemplate further extension of the STA without a concurrent proposal for permanent rules for automatic control of HF data communications. The concern about the continuation of the STA was not at all based on the level of success of the experimental operations conducted pursuant thereto. The STA, by all accounts, has worked well, and has revealed both the strengths and shortcomings of data protocols, modes, and utility of certain data communications at HF.¹⁰ The STA was useful, and the patience

¹⁰ In January of 1989, the League's Committee on Amateur Radio Digital Communications summarized the League's findings from communications conducted pursuant to the STA as follows:

- A. The system works, moves traffic and, with careful frequency selection, can provide a public service without undue interference to other amateur activities.
- B. Network management and control are necessary.
- C. Accountability for traffic should principally be with the station introducing it into the network. Accountability at relay points is not a practical alternative.
- D. Packet radio is not compatible with other modes and needs separate frequencies. Carrier sense is not adequate to protect against interfering with other modes on HF owing to transmission impairments, hidden station effects, and the like.
- E. Frequency stability should be on the order of 10 Hz.
- F. Protocols need improvement, and new capabilities are needed.

and cooperation of the Private Radio Bureau in permitting and continuing it was and is well appreciated by the amateur radio community.

III. RM-7248 and The League's Survey

8. After the grant of the League's STA in mid-1987, while the experimenters were working to develop operational standards for automatic control of data communications on HF bands, the Commission commenced a review of the Amateur Radio Service Rules in Docket 88-139, looking toward a restatement of the rules to permit, among other things, the flexibility to accommodate newer (data) technologies. The League noted in that proceeding that neither the Commission's proposed restatement of the rules, nor the League's proposal for a slightly different restatement, could constitute any "final" version thereof. It was recommended that the Commission leave the matter of new rules governing data communications for a separate proceeding. This the Commission chose to do, avoiding any substantive changes in data communications rules in that proceeding.

9. Based on the results of the STA operation between mid-1987 and the end of 1989, the League filed a Petition for Rule Making, RM-7248, on December 12, 1989. The petition proposed amendment of

G. Modems need improvement.

H. Watchdog timers, to disable the transmitter in the event of malfunction, are essential.

I. Stations need to change frequencies in accordance with propagation conditions to improve efficiency, reduce retries, and free up frequencies for other users.

J. Power limitations specific to data modes are neither practical nor justified.

numerous rules in Part 97 to permit automatic control of HF data communications. It proposed that automatically controlled stations would be limited to specific subbands. The subbands chosen were in accordance with the IARU Region 2 band plan that was in existence at the time. The Commission placed the petition on Public Notice,¹¹ and a relatively large number of comments were filed, most of which stated opposition to the petition as filed.

10. Even so, the concept of automatically controlled HF stations transmitting data communications was **not** unpopular generally. Most comments on the petition asserted that the specific choice of rule-imposed subbands for automatically controlled data stations was not acceptable.¹² This aspect of the petition proved difficult to address, because the League felt obligated to propose subbands consistent with internationally accepted band plans. The unacceptability of the subbands chosen, however, resulted in a decision to withdraw the petition in order

¹¹ Public Notice was given February 6, 1990 (Report No. 1807).

¹² In this respect, the League was faced with something of a dilemma: the band planning effort of IARU Region 2 provided certain band plan configurations for HF data communications from which the League could not reasonably depart, consistent with its international obligations. However, certain components of the understandings reached by the Region 2 organization were not accepted by those opposed to RM-7248. Non-compliance with the accepted band plan offered the possibility of interference internationally; compliance was not acceptable to a significant portion of the League's membership.

to rethink the matter.¹³ It was difficult to reconcile the apparent need for rule-imposed subbands for automatically controlled MF and HF data operation (for interference protection for other modes, and the compatibility of certain data modes with other data modes) with the need to avoid incompatibility with data operation in other countries in Region 2. As the League noted in its letter to the Chief, Private Radio Bureau, requesting dismissal of the petition (without prejudice), the pleading cycle on that petition was useful to the Amateur Radio Service in that it brought certain issues to the League's attention, issues which have since been rethought in detail.

11. Following the withdrawal of RM-7248, the League studied the options for automatic control of HF data communications through

¹³ The League filed a letter to the Chief, Private Radio Bureau dated April 19, 1990, requesting withdrawal of the petition. Therein, the League stated, inter alia that:

The League is no longer convinced that rules proposed in its petition necessarily represent the most efficient plan for permitting automatically-controlled HF RTTY and data communications in the Amateur Radio Service. The petition incorporated previously-concluded international band planning efforts of IARU Region 2, though other approaches could be consistent with such planning as well. The League's Board of Directors would like to have the opportunity to revisit the matter, and to consider alternatives to the specific proposal contained in the petition, and so respectfully requests that the petition for rule making, RM-7248, be withdrawn without prejudice at the present time.

The League requested as well that the STA be continued in order to develop further experimental data. The petition was dismissed without prejudice in response to the League's request, by letter of the Chief, Special Services Division, by letter dated 23 April, 1992.

the work of committees of amateurs interested in the matter, as well as through the collective experience of the STA participants. In January of 1992, the League published in its monthly journal, QST, a survey, asking its members to respond to specific questions in order to plan automated data message systems below 50 MHz. The survey, and the tabulated results thereof, are attached hereto as Exhibit A. The survey described configurations of systems of data transfer between and among stations, and asked which, if any, were deemed suitable in the Amateur Radio Service at HF frequencies, given the need for prevention of interference, and for self-enforcement against intruders. The survey stated, in part, as follows:

It is possible for an unattended automatic digital station to work another station that is being controlled by an operator who is present and can listen to the frequency that is to be used to ensure that it is free before initiating a contact. In this style of operation, the frequency can be shared by more than one digital mode. Setting the frequency aside for a specific digital mode is not essential...RTTY and AMTOR MBOS typically operate in this mode.

It is also possible for an unattended automatic digital station to work another unattended automatic station. In this style of operation, the frequency used must be set aside for the specific digital mode the stations are using at the time such communications are to take place. Sharing the frequency with another mode is not possible since there is no practical means of listening to the channel to determine if the channel is already in use by another mode of signal...Packet BBSs typically operate this mode.

It was also noted that all digital modes are capable of either type of operation. Obviously, all digital modes can be conducted under local or remote control as well, though such a requirement significantly slows data transfer, and precludes exploration and

use of the full capabilities of the data modes in network configurations. With respect to certain modes, local control adds little in terms of real-time monitorability of communications through the network of data stations, other than with respect to interference to other users of the same frequency bands.

12. There were 507 respondents to the League's survey. The results of the survey, and all written comments, were carefully studied by the League's committee, and the results tabulated as per Exhibit A. The results of the survey substantially supplemented the information contained in the comments filed in response to RM-7248.¹⁴ The combination of those sources, and extensive committee work since then, led the League's Board of Directors to a series of conclusions, which were discussed at length in July of 1992. The tenor of the survey responses reflected concern over interference from automatic control on HF bands, and was surely colored by the previous League proposal for creation of subbands that conflicted with users of other modes. In any case, it was clear that there should be no automatic control at random at HF. There was a split of opinion as to whether automatic controlled stations should be limited to communication with stations under local or remote control, or whether automatically controlled stations should be

¹⁴ For example, the comments in response to RM-7248 indicated strongly that the subbands for automatically controlled data stations at HF proposed to be created by rule were unacceptable. The survey, however, revealed some support for the operation of such modes in specific subbands. The conclusion reached by the League is that Commission-regulated subbands are useful in this context, but that the choice of universally acceptable subbands would be very difficult.

permitted to communicate with other automatically controlled stations. Regardless of the type of automatic control operations permitted, however, survey respondents believed that any such operation should be within specific subbands.

13. The survey results indicated significant opposition to allowing automatically controlled data stations at HF to communicate at random on HF frequencies, because to do so would create a significant possibility of interference to ongoing communications using other modes. Though the commenters in RM-7248 had made clear that the subbands earlier proposed by the League were not universally acceptable, the results of the League's survey indicated that if any stations transmitting HF data are permitted to be operated under automatic control, they should be permitted to operate only in specific subbands. Thus, the League was left with the dilemma of its obligation to comply with the band plan for such established by international agreement, and the rejection of the same by United States amateurs.

IV. "Semi"- Automatic Control

14. By mid-1992, after the League's survey, it was apparent that automatically controlled HF data communications, if at all, should be conducted in specific subbands only. It was also apparent that the amateur community was not unanimously agreed as to the type of automatic control to be authorized, if any, for HF data. It was decided by the League's Board at that time that the Commission should not be asked to permit automatically controlled stations to communicate with other automatically controlled stations, because

such appeared from the survey to be inadvisable outside of specific subbands (for interference reasons). And, as discussed above, the creation of subbands by rule was problematic at that time due to the fact that the subbands for automatically controlled HF data communications contained in the IARU Region 2 band plan in effect at the time had proven unpopular to a number of United States amateurs when the League proposed it in RM-7248). The League decided therefore to propose that automatically controlled stations in the MF and HF bands not be permitted to communicate between, or among, themselves. Rather, such stations would be limited to communication with stations under local (or remote) control, and that the subbands for such operation be left to voluntary band planning.

15. This compromise plan, however, was not put forward in any petition to the Commission, as it was criticized as unworkable (and unacceptable to certain participants in HF packet networks) as soon as it was announced. Its restrictions constituted distinct limiting factors, which would preclude to a great extent the full utilization of the communications opportunities offered by the technology. Relay of data messages between and among automatically controlled stations is far more efficient and rapid than networks made up of a combination of automatically controlled stations and locally or remotely controlled stations.¹⁵ Thus, in August of

¹⁵ The efficiency and benefit of permitting automatically controlled data stations to operate in network configuration is not limited merely to the speed by which messages are transmitted, which is a good and sufficient reason alone to permit such. In addition, such networks are efficient in terms of band occupancy.

1992, the League's Executive Committee asked the Committee on Amateur Radio Digital Communications to revisit the issue once again, which it did in late September, together with a representative group of the STA participants.

V. The Revised IARU Band Plan for HF Data Communications

16. Fortunately, the development of internationally agreed-upon subbands for automatically controlled HF data communications was greatly facilitated at the IARU Region 2 General Assembly held in Curacao, Netherlands Antilles, in early September, 1992.¹⁶ That

As noted herein, the HF amateur bands are extremely crowded. The use of automatic message forwarding permits such message forwarding to be scheduled at times other than peak use periods for real time communications between stations under local control. The spectrum efficiency of such networks is thus beneficial and useful, and should be encouraged.

¹⁶ The International Amateur Radio Union (IARU) is the worldwide union of national amateur radio societies. It is an international organization that is recognized by the ITU as representing the amateur and amateur-satellite services and the more than two million radio amateurs throughout the world. It is comprised of 126 member-societies and is organized into three Regions corresponding with those of the ITU. The IARU participates in the work of the ITU including Radio Conferences and Study Groups. It also sponsors Amateur Radio Administration courses primarily for regulators in developing countries in conjunction with the ITU and the USTTI.

The IARU is governed by an Administrative Council consisting of members from the three Regions and is served by its International Secretariat located in Newington, Connecticut. Each of its three Regions meets triennially so there is one Region meeting every year. (The Chief, Private Radio Bureau attended the 1989 Region 2 Conference in Orlando, Florida). These IARU Regional Conferences are responsible for coordinating spectrum management policies within their Regions, including the development of voluntary regional band plans that recommend the types of emission to be used in segments of amateur bands. While these regional band plans do not carry the force of either ITU or national regulations, they are respected by licensed amateurs, and national amateur radio societies, throughout the world.

meeting, which included representatives of national amateur radio societies representing 38 countries in IARU Region 2, produced a substantially revised HF band plan. The new plan included segments in HF bands in which automatically controlled data communications could be conducted with less risk of interference to other, incompatible modes. This band plan superseded the prior plan, and represents a provision for such operation which is fully compatible with that of the other two IARU regions.¹⁷ It is substantially different from the band plan previously in existence when the League prepared RM-7248. The new IARU band plan provides segments on each amateur HF band for digital modes, including RTTY, AMTOR and Packet, defined as including new systems such as CLOVER and PACTOR, but excluding Facsimile and SSTV. CW would continue to be a permitted mode throughout all amateur bands.

VI. Automatic Control and Interference Concerns

17. RM-7248 had proposed simply that any amateur station authorized to use data communications on HF frequencies could operate under automatic control while transmitting data communications, provided that such was conducted on specific, rule-imposed subbands. With such an approach, as it appears, the principal problem noted was that some of the subbands chosen (which

¹⁷ Part of the reason that this band plan was not developed sooner relates to the structure, and timetables, for IARU regional conferences, which are triennial, and staggered among the regions. The September Region 2 General Assembly provided an opportunity to conform its digital communications band plan with that of Regions 1 and 3, previously adopted.

were selected for consistency with the then-appertaining IARU Region 2 Band Plan, as discussed above) were already occupied by stations using operating modes that were incompatible with certain other data modes. Subbands were deemed necessary for interference avoidance because, in bands where incompatible operating modes shared the same frequencies, automatically controlled stations could communicate with each other in a network, without "listening" to a frequency to first determine if it is in use before transmitting. Sudden transmissions could interrupt an ongoing communication in a non-data mode. The fear of those in opposition to RM-7248 was that interference would result to preexisting, regular communications in the proposed subbands. Modes such as RTTY, which are incompatible with certain other data modes, would potentially receive interference. The RM-7248 commenters were, quite reasonably, concerned about disruption of existing operating patterns and band usage by stations within the proposed automatic control segments using incompatible modes.

18. Compounding this problem are several unalterable circumstances relative to HF operation generally. First, amateur HF allocations are heavily occupied by amateur stations using various modes of operation. Second, there is a continuum of change in HF propagation. Changes in propagation paths and signal strengths can and often do occur so suddenly that an ongoing communication between two stations (in any mode) may be neither causing nor receiving interference one minute; but the next minute, due to propagation shifts, harmful, even preclusive interference can

appear to or from another communication on the same or adjacent frequencies. Third, there is no "channelization" in the HF amateur bands (as indeed there should not be, for reasons not necessary to explore herein). Because the subbands for automatically controlled data stations proposed in RM-7248 included segments in which certain operations were already firmly established,¹⁸ and given the above factors, it is understandable that some amateurs were concerned about the disruption of existing communications that would result from the RM-7248 plan.

19. The above circumstances do not uniquely affect automatically controlled stations. The phenomenon is present in varying degrees where numerous modes of operation share limited frequencies. However, the incompatibility between certain data modes and other amateur operating modes would be quite apparent at HF, if automatically controlled stations in crowded bands were allowed to transmit without an interference avoidance mechanism. It is inevitable that any band segment in the HF amateur spectrum is

¹⁸ As concluded recently by the League's Committee on Amateur Radio Digital Communications:

It is no secret that available space is very limited in the HF spectrum. Nowhere is that more evident than in the very popular 20 and 40 meter bands. The two oldest modes of operation, voice and CW, have the lion's share of the spectrum in those bands since they were in heavy use before there were any digital modes. The digital modes have simply "squeezed in the cracks" between already established modes of operation. Since the digital modes have become established they have expanded gradually, a little at a time, primarily into space occupied by CW operation. Frequencies near the edges of digital mode operation continue to be shared by both digital and non-digital modes.

(at least until differing operating patterns evolve), going to be shared among differing modes of operation. This is not a new condition on the HF bands, and the phenomenon has been accommodated for decades by cooperation among amateurs. The crowded conditions, however, and the inability of an automatically controlled station to "listen" prior to transmitting to prevent interference, dictate some element of control, by creation of specific subbands. If messages are to be passed between amateur stations without any operator intervention and no operator present at either station, it will have to be done on frequencies where amateurs expect such operation. Otherwise, random automatic control of data stations at HF would undermine the degree of cooperation in interference avoidance that HF operation, by its nature, has always required. If automatic control operation is allowed only in subbands created by rule, the problem will still exist to a minor extent, until revised operating patterns emerge. However, by designating small subbands for automatically controlled data operation, there will be advance notice to amateurs operating in that segment that automatically controlled data stations may commence transmissions. From the point of view of other stations operating in that subband, operators would have advance notice of the possibility of interference to communications using an incompatible transmission mode. Data communications outside those subbands would be limited to local control, thus providing the necessary degree of manual interference avoidance.

20. In addition to the inevitable loading of the HF bands and the characteristics of HF propagation, there are some essentially immutable principles of HF operation contained in the Commission's rules that bear on the concept of automatically controlled HF data communications. The first is that an amateur station may not willfully or maliciously interfere with or cause interference to any radio communication or signal, regardless of the mode of operation or the perceived importance of the communication in progress.¹⁹ The second is that no frequency will be assigned for the exclusive use of any station, and thus no station, regardless of operating mode, has any greater right than any other to the use of a frequency.²⁰ These operating principles are, at the present stage of development of data communications, somewhat at odds with the concept of automatic control of data stations at HF. Such operation, by its nature, is mode-specific, and automatically controlled stations will not necessarily be able to determine whether the frequencies on which they transmit are occupied by a station using another mode at the time they commence a transmission. Sharing, and the "cooperation" necessary to interference avoidance are, under present technology, difficult to implement.

21. Notwithstanding all of the above, as discussed above, there remain good and sufficient reasons why automatically

¹⁹ 47 C.F.R. Section 97.101(d).

²⁰ 47 C.F.R. Section 97.101(b).

controlled data communications at HF should be authorized. Automatically controlled HF operation is absolutely essential to the handling of National Traffic System emergency and public service messages between amateurs through intermediate stations. HF data communications have provided a marvelous means of rapid data transfer in emergency communications, and the ability to do so over long distances rapidly requires the use of automatically controlled HF stations to move the data through the system, between and among locally controlled stations.²¹ The infrastructure for this system, to move this traffic, must be operational in advance of any emergency, when the need for its use becomes acute. In addition, such operation permits amateurs nationwide and worldwide to exchange communications when there is a time difference between the operating times available. It permits the quick relay and exchange of reliably transmitted messages, avoiding the delay inherent in coordinating operator schedules in keyboard-to-keyboard operation. Further, it permits management of peak load requirements in the crowded HF bands by shifting automatic message forwarding to times of day when fewer operators of other modes are active. Moving messages at machine speeds, without the delays and interruptions in

²¹ The feasibility of automatically controlled operation on AMTOR has been demonstrated by U.S. amateurs operating under an STA granted prior to the League's STA. Similar to packet, the AMTOR protocol incorporates error control provisions, making it suitable for automatic control operation. At the present state of development, AMTOR has been proven considerably more robust than packet radio at HF, and is used to bridge difficult radio paths within the worldwide packet radio network. Thus, operation of digital stations under automatic control should not be limited to a single data mode.

relaying messages caused by the unavailability of network link stations (due to the vagaries of operator schedules), is far more spectrum efficient and makes more frequency time available for other types of communications, including direct keyboard-to-keyboard communications.

22. Finally, and not to be lost in the above discussion of the practical amateur uses of automatically controlled HF data stations, is that the development of new software and hardware to refine the technology and further new types of data communications and data networks requires that at least some amateur stations in a network be permitted to operate under automatic control in the HF amateur bands, and that some automatically controlled stations be permitted to relay signals to other stations also under automatic control. Operation pursuant to the League's STA has shown that automatic control of HF data communication is workable and should be permitted under conditions sufficient to prevent interference to other amateur stations in the same HF bands using other emission types and modes.

VII. A Regulatory Approach for Automatically Controlled Data Communications

23. Because some automatically controlled HF data operation is necessary and desirable; because it is more difficult at HF frequencies than at VHF and above, in terms of interference avoidance, to have two or more automatically controlled stations communicating with each other in other than specified, regulated subbands; and because the creation of subbands by rule for automatically controlled HF data communications is now workable,